

Knowledge, practices and perceptions of farmers on whitefly (*Bemisia tabaci*) management in okra cultivation in South Gujarat

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ABSTRACT

The study assessed farmers' knowledge, practices and perceptions regarding whitefly, *Bemisia tabaci* management in okra cultivation in Navsari, Surat and Bharuch district during 2023. From each of the three selected districts, 20 okra-growing farmers were randomly selected and resulting in a total sample size of 60 respondents. The findings revealed about 55.00 per cent cultivated okra on less than 1 ha, with summer and monsoon being the major preferred seasons. Almost all respondents could identify major okra pests, including whitefly; however, considerable gaps existed regarding its damaging stage and economic threshold level (ETL). Chemical control was the predominant management practice adopted by 83.33 per cent of respondent. Most farmers relied on approximate pesticide doses and applied sprays 4–6 times at intervals of 4–6 days. Although farmers were aware of pesticide disposal and environmental effects, inadequate use of personal protective measures was observed. The study highlights the need for farmer-oriented training on ETL-based pest management, correct pesticide dosage, safe handling and integrated pest management practices for sustainable and safer whitefly management in okra.

Keywords : Okra, whitefly, field survey, insecticides, pesticide use pattern

INTRODUCTION

Okra (*Abelmoschus esculentus* L. Moench) is an important vegetable crop cultivated extensively in India during summer and *kharif* seasons. The crop is valued for its nutritional and economic importance and provides an important source of income to vegetable-growing farmers. However, okra is attacked by a diverse complex of insect pests, including leafhopper (*Amrasca biguttulabiguttula* Ishida), aphid (*Aphis gossypii* Glover), whitefly (*Bemisia tabaci* gennadius) and shoot and fruit borer (*Earias* spp.). Among these, whitefly, *B. tabaci*, is a highly polyphagous and genetically diverse pest complex distributed across tropical and subtropical agricultural regions. *B. tabaci* is an important sucking pest because both nymphs and adults feed on plant sap, resulting in physiological stress, yellowing and weakening of plants. In addition to direct feeding damage, the pest is an important vector of several plant viruses thereby increasing its economic significance in vegetable production systems (Gilbertson *et al.*, 2015; Aarwe *et al.*, 2020).

The effectiveness of integrated pest management depends not only on the availability of appropriate technologies but also on farmers' knowledge, perceptions and adoption behaviour. Farmers' ability to correctly identify the pest, understand its damaging stages, recognize economic threshold level, select appropriate management options and apply pesticides at recommended doses plays a critical role in achieving effective and economical pest management. The situation is especially relevant in Gujarat, where okra is an important vegetable crop and farmers frequently depend on chemical pesticides for managing insect pests. A survey conducted among okra growers in Tapi district of South Gujarat reported considerable gaps in farmers' knowledge regarding recommended pesticides, dosage, safe harvest intervals, personal protection, label claims and proper disposal of pesticide containers. The study emphasized the need for farmer education regarding safe and judicious pesticide use for producing safer and residue-free okra (Chavan *et al.*, 2022). Jeyanthi and Kombairaju (2005) studied the pesticide use in important vegetable crops, viz. chillies, cauliflower, brinjal and okra. Average pesticide

usage has been estimated at 5.13, 2.77, 4.64 and 3.71 kg a.i./ha on chillies, cauliflower, brinjal and okra crops, respectively.

Understanding farmers' existing knowledge and practices is essential for identifying gaps between recommended pest-management technologies and their field-level adoption. Such information can help in developing need-based extension programmes focusing on pest identification, ETL-based decision-making, appropriate pesticide selection and dosage, safe pesticide handling, conservation of natural enemies and adoption of integrated pest management practices. The study specifically aimed to document farmers' knowledge of whitefly identification, assess their existing management practices and pesticide-use behavior, determine their perceptions regarding pesticide safety and environmental effects, and identify major gaps requiring attention through farmer-oriented training and extension interventions.

MATERIAL AND METHODS

Study Area

The present investigation was conducted in the major okra growing villages of **Navsari, Surat and Bharuch** of South Gujarat region were randomly selected for the present study to assess farmers' knowledge, practices and perceptions regarding the management of whitefly, *B.tabaci* in okra cultivation.

Selection of respondents and sampling procedure

A multistage random sampling procedure was followed for the selection of respondents. From each of the three selected districts, major 20 okra-growing farmers were randomly selected each from Navsari, Surat and Bharuch district and resulting in a total sample size of 60 respondents. The respondents were selected from villages where okra cultivation was undertaken during the study period. A structured interview schedule was developed to collect information on farmers' socio-economic characteristics, knowledge of whitefly identification and biology, management practices, pesticide-use behaviour, perceptions regarding pesticide safety and environmental effects, and adoption of integrated pest management practices.

Development of the interview schedule

Relevant variables and indicators were identified through an extensive review of available literature and previous research related to whitefly management, insect-pest knowledge, pesticide-use practices and integrated pest management in okra.

Data collection and statistical analysis

Primary data were collected through **personal interviews** with the selected respondents. Each farmer was interviewed individually at the farm or residence, and the responses were recorded systematically in the interview schedule. Descriptive statistical techniques were used to summarize the characteristics, knowledge, perceptions and management practices of the respondents. The frequency and percentage values were used to present and interpret the survey findings regarding farmers' knowledge, pesticide-use practices, perceptions and management of whitefly in okra cultivation.

RESULTS AND DISCUSSION

The survey was conducted among 60 okra-growing farmers in South Gujarat to assess their personal profile, cropping characteristics and knowledge regarding insect pests and pesticide use. The major findings are summarized below.

Personal profile of the respondents

The data presented in Table 1 revealed that the 60.00 per cent of the respondents belonged to the middle-age group (35–50 years), indicating that okra cultivation was mainly undertaken by economically active farmers. Regarding education, 41.67 per cent had higher secondary/diploma-level education, followed by 35.00 per cent with secondary education. This relatively satisfactory educational status may facilitate the adoption of improved pest-management practices. With respect to landholding, the largest proportion of respondents (33.33%) possessed 2–4 ha of total land, while 25.00 per cent were marginal farmers. However, okra cultivation was predominantly undertaken on a smaller area, with 55.00 per cent of farmers cultivating okra on up to 1 ha. Summer was the most preferred season (38.33%), closely followed by monsoon (36.67%), while 25.00 per cent cultivated okra during both seasons. Thus, the concentration of okra cultivation on small areas and its seasonal nature may influence farmers' pest-management decisions.

Table 1 : Personal and farm characteristics of respondents (n = 60)

Characteristic	Category	Frequency	Percentage
Age	Up to 35 years	6	10.00
	35–50 years	36	60.00
	Above 50 years	18	30.00
Education	Illiterate	0	0.00
	Primary	4	6.67
	Secondary	21	35.00
	Higher secondary/Diploma	25	41.67
	Graduate and above	10	16.67
Total land holding	Up to 1 ha	15	25.00
	1–2 ha	13	21.67
	2–4 ha	20	33.33
	4–10 ha	12	20.00
	Above 10 ha	0	0.00
Land under okra cultivation	Up to 1 ha	33	55.00
	1–2 ha	25	41.67
	2–4 ha	2	3.33
Okra growing season	Winter	0	0.00
	Summer	23	38.33
	Monsoon	22	36.67
	Summer and monsoon	15	25.00

Respondents knowledge about insect pests and pesticides use in okra crop

The survey was conducted among 60 respondents to assess their knowledge of whitefly and pesticide-use practices in okra. Most respondents (76.67%) could identify four insect pests damaging okra crop, while cent per cent could identify whitefly (Table 2 and Fig. 1). However, only 63.33 per cent

could identify the damaging adult stage and 36.67 per cent had no knowledge of its damaging stage. Chemical control was the predominant management practice, with 83.33 per cent of respondents using chemical pesticides as their first method of whitefly control. None of the respondents had knowledge of the Economic Threshold Level (ETL), indicating a major gap in scientific pest-management knowledge.

Table 2: Summary of major findings on whitefly knowledge and pesticide-use practices in okra (n=60)

Sr. No.	Parameter	Major response	Respondents (%)
1	Pests identified in okra	Identified four pests	76.67
2	Identification of whitefly	Yes	100.00
3	Damaging stage of whitefly	Adult	63.33
4	Maximum whitefly infestation stage	No idea	45.00
5	First method of whitefly control	Chemical method	83.33
6	Knowledge of ETL	No	100.00
7	Major factor in pesticide selection	Cost + efficacy	63.33
8	Preferred spray timing	Morning and evening	55.00
9	Pesticide purchased on label basis	No	60.00
10	Dose measurement	Graduated bottle cap	100.00
11	Use of recommended dose	Yes	38.33
12	Mixing pesticide with stick	Yes	100.00
13	Spraying frequency	4–6 times	73.33

Sr. No.	Parameter	Major response	Respondents (%)
14	Spraying interval	4–6 days	53.33
15	Waiting period	3–4 days	80.00
16	Method of pesticide application	Spraying	100.00
17	Mixing of pesticide formulations	No	100.00
18	Pesticide storage	Farm site away from house	70.00
19	Safety practice	Covering mouth and nose with cloth	58.33
20	Commonly used pesticide for whitefly	Fonicamid 50 WG	30.00
21	Knowledge of pesticide disposal	Yes	100.00
22	Disposal of empty containers	Burning/burying in pits	55.00
23	Knowledge of environmental effects	Yes	90.00
24	Consumption of own-farm okra	Yes	100.00

Fifty five per cent respondents preferred spraying the pesticides during morning and evening. Sixty per cent did not purchase pesticides based on label information. Although all respondents used the bottle cap for dose measurement and sticks for mixing, only 38.33 per cent reported using the recommended dose. Most respondents (73.33%) sprayed pesticides 4–6 times during the crop period and 53.33 per cent maintained a 4–6-day spraying interval. About 80.00 per cent followed a waiting period of 3–4 days. Maximum (80.00%) respondents followed 3 to 4

days of waiting period for harvesting of the okra fruits. All respondents applied pesticides through spraying and did not mix insecticide and fungicide formulations. Regarding safety, majority (58.33%) of respondents have not kept the covering of mouth and nose with cloth at time of handling or spraying of pesticides. Fonicamid 50 WG (30.00%) was the most commonly used pesticide, followed by acetamiprid 20 SP (28.33%) and imidacloprid 17.8 SL (20.00%). Although all respondents had knowledge of pesticide disposal, 55.00 per cent disposed of empty containers by burning/burying them.

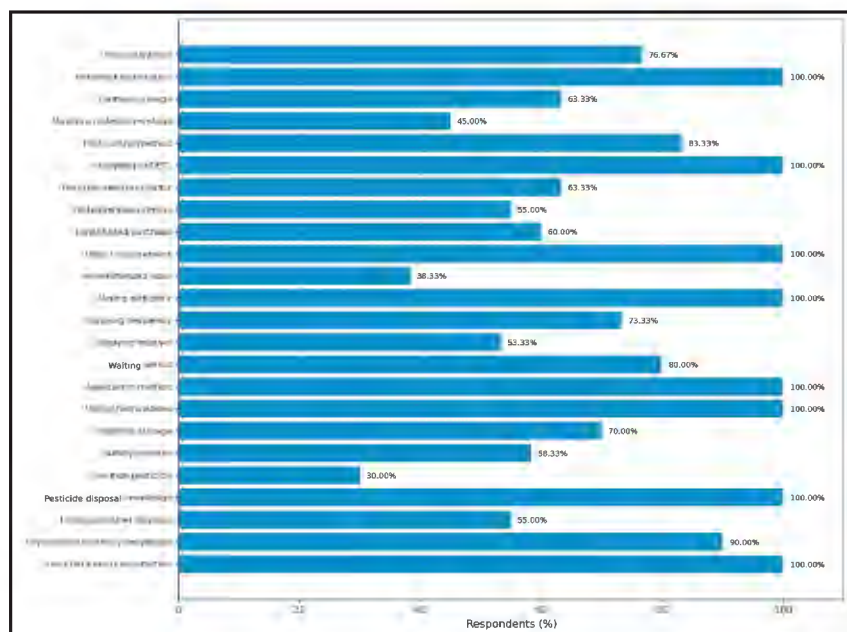


Figure 1 : Respondents' knowledge and practices regarding whitefly and pesticide use in okra crop

Overall, the respondents possessed good basic recognition of whitefly but showed inadequate knowledge of ETL, pesticide labels, recommended doses and personal protective measures. The heavy dependence on chemical control, together with frequent spraying, highlights the need for farmer training on IPM, ETL-based decisions, safe pesticide handling, proper disposal and judicious pesticide use. Despite this, the high level of awareness regarding environmental effects (90.00%) provides a useful foundation for promoting safer and more sustainable whitefly management. It was also found that 100 per cent of respondents consume okra fruits that are grown in their own fields.

The results are more closely similar with Anil Kumar *et al.*, 2017 who noted that 70.00 per cent of the farmers contacted to pesticide dealers for recommendations and only few farmers *i.e.* 16.00 per cent preferred to contact agricultural officers and about (60.00%) of the farmer followed the waiting period of week. Meenambigai *et al.* (2017) reported that the imidacloprid (36.67%) was used by farmers in okra. About 75.83 per cent of okra farmers approached pesticide retail shops for purchase pesticides and spraying interval of 10-14 days (52.33%). Though most of the farmers (93.33%) did not follow any safety measures while undertaking spraying operation, all the farmers (100.00%) have used stick for mixing of pesticide. Half of the respondents (50%) dispose by burning or buried in the soil which is line with the findings of Vani *et al.* (2005). According to Chavan *et al.* (2022), the respondents used the acetamiprid 20 SP (52.00%) maximum followed by thiamethoxam 25 WG (25.00%) in okra. Respondents preferred to apply pesticides in the following days' interval- 2-3 days (0%), 4-6 days (4%), weekly (41%) and depending upon the pest/ disease infestation/ infection (55%) before commencement of picking. Maximum (53.00%) the respondents follow 3-4 days of waiting period. Majority of the respondents (76.00%) have not followed the protective measures during spraying. Half of the respondents (50.00%) disposed the empty pesticide container/packing material by throwing away at roadside, along the borders of the field and half of the respondents (50.00%) dispose by burning or buried in the soil. All the respondents mixed the chemical by using stick and avoiding bare hands; majority of the farmers followed safe methods while storing or mixing or spraying which may be due to awareness on the effect on health and majority of the farmers measuring the pesticides by pesticide container cap was due to their habituated to its usage. Present finding confirms the findings of Anil Kumar *et al.* (2017).

CONCLUSION

The present study revealed that okra growers in South Gujarat possess basic practical knowledge of whitefly identification; however, important gaps remain in scientific, need-based and safe pest-management practices. The major knowledge gaps were related to recognition of the most damaging stage, understanding of peak infestation periods, and particularly awareness of the Economic Threshold Level (ETL) for initiating control measures. Farmers also showed inadequate understanding of pesticide label information, recommended dosages, appropriate use of personal protective equipment (PPE), and safe disposal of empty pesticide containers. The predominance of chemical control and repeated pesticide applications further indicates a need to strengthen farmers' understanding of Integrated Pest Management (IPM) and judicious pesticide use. At the same time, the high level of awareness regarding the environmental effects of pesticides provides a useful foundation for promoting safer and more sustainable practices.

Based on these findings, the following extension interventions are recommended:

Conduct regular farmer training and field demonstrations on whitefly identification, pest monitoring, ETL-based decision-making, and integration of non-chemical IPM methods to reduce unnecessary pesticide applications.

Strengthen pesticide-safety education through practical demonstrations on reading labels, using recommended doses, selecting appropriate PPE, observing pre-harvest intervals, and safely disposing of empty pesticide containers.

Promote farmer advisories and participatory IPM programmes through extension personnel, demonstrations, mobile-based advisories and input-dealer sensitization, with emphasis on need-based pesticide application and environmentally safer whitefly-management practices.

Thus, extension efforts should focus on transforming farmers' existing practical experience into scientifically informed, judicious and sustainable whitefly management practices in okra cultivation.

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